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and The AIRCRAFT ENGINEER

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The Outlook

France's Surrender

THE acceptance by France of Germany's terms is a matter for statesmen, soldiers and historians to discuss. It will be a subject of such debate for centuries to come. Here let us merely say that we remember the heroism with which the French Army, in several cases very badly led, fought itself to a standstill. Over the heads of the soldiers there fought with equal gallantry the *escadrilles* of *l'Armée de l'Air*. It, too, was out-numbered and was terribly short of aircraft. That shortage increases the respect which we feel for the pilots and air crews, who lived up to the reputation set up twenty-five years ago by Georges Guynemer. The squadrons of the Royal Air Force who fought in France showed the esteem in which they held their French brothers-in-arms by each officer exchanging one button from his tunic with a French flying officer. Whether our men will now continue to wear that badge we cannot say, but we are sure that our men grieve for the sad fate which has befallen their late comrades.

The French aircraft industry is now under the control of the Germans. The resources of the *Luftwaffe* are so multitudinous that they may not need to make use of the French factories, but they will certainly be able to get from France much material of which they have hitherto had only a limited supply. That will increase the odds against Britain, and we have no illusions about the difficulty of the struggle which lies ahead of us.

But, though the Germans have in a few weeks broken the military power of France they cannot in a like few weeks produce the spirit and high training which lie behind the Royal Air Force. Our men and machines have outclassed those of the *Luftwaffe*.

THANKS TO THE AIRCRAFT INDUSTRY

Air Chief Marshal Sir Cyril L. N. Newall, Chief of the Air Staff, has issued the following appreciation of the work of the aircraft industry :—

On behalf of the R.A.F. I desire to express the sincere gratitude of all ranks to the aircraft industry for their magnificent response to the additional calls upon the industry that have been made in the past three weeks. In particular, the R.A.F. wishes to offer its thanks to the great body of men and women who, by working for long hours at high pressure, have made it possible to achieve an outstanding contribution to our air effort.

The Attack on Great Britain

THE first raid in force on this country took place on the night of June 18-19, when some hundred German bombers crossed our East Coast and then spread out fanwise. They seem to have been searching for our aerodromes. There was bright moonlight that night. Seven of the raiders were shot down, one by A.A. guns and the others by fighters. The next night a somewhat larger force of bombers came over and again distributed themselves over the country, this time apparently trying to bomb munition factories. This time three were shot down. In each case others may have been damaged and unable to get home, but in making up our profit and loss account they must be left out of consideration. Two hit balloon wires. Others, too, may have been driven back without releasing their bombs.

Not unnaturally some disappointment has been felt that out of 200 bombers only twelve were certainly destroyed, on nights which favoured the defence in that there were no clouds to give cover to the raiders. The contrast with the air fighting over Dunkerque, when each day our fighters destroyed large numbers of the enemy, is certainly striking and calls for some explanation.

That explanation can be found in the conditions of the operations and the tactics employed. At Dunkerque everything was concentrated; in the raids over Britain the German effort was distributed. In the first case the German bombers had not to search for their targets.

Troops on shore and ships in the narrow seas provided a multitude of targets, and it was inevitable that the bombers should do a certain amount of damage. But the British fighters also had not to search for their quarry. It came to them. They could not give complete protection—that is always impossible—but they so reduced the damage that an evacuation which in theory should have been out of the question was, in fact, successfully carried out.

The tactics of the German night raiders over Britain were the exact opposite to those employed over Dunkerque. The raiders made no attempt at concentrated bombing. Consequently, though they escaped heavy losses, they did comparatively little damage.

Air Transportation

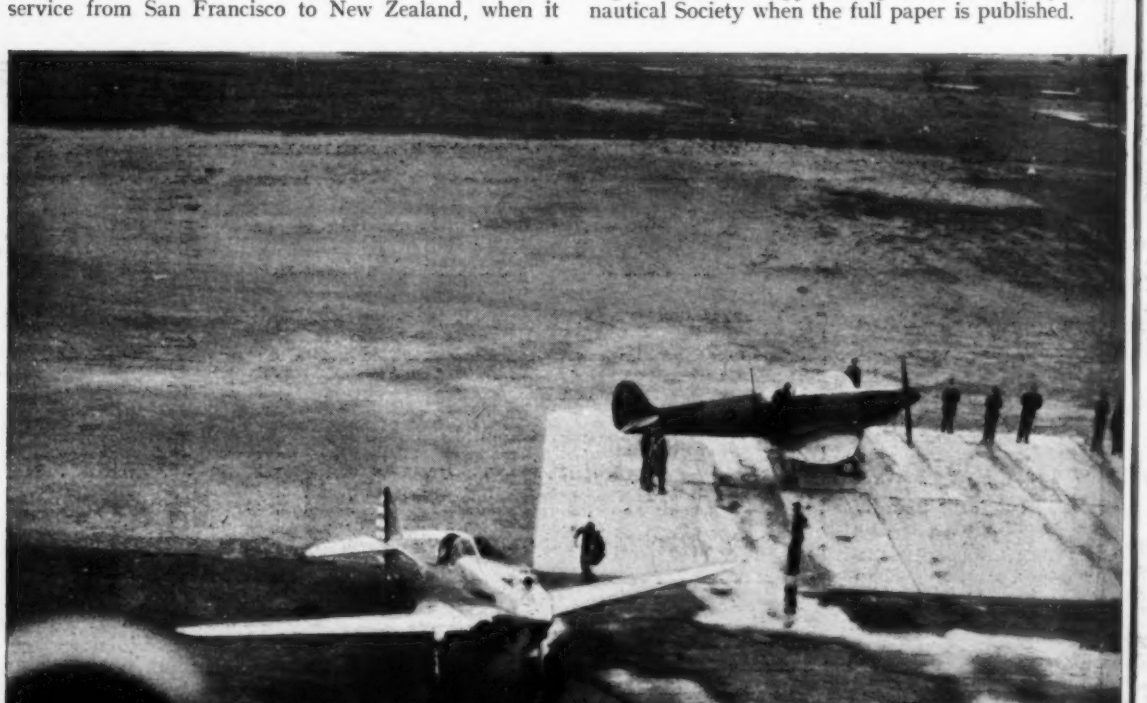
THE announcement by British Overseas Airways that the Empire route between Durban and Sydney is again in operation came remarkably promptly. It followed a few days of suspension of British air transport on the overseas routes, subsequent to Italy's declaration of war. We hope that a way may be found to connect this route to England and so to maintain our air communications with our own aircraft. The relation of Italian and other enemy territory to our routes in the Mediterranean and Africa is shown in an article on page 562.

In the meantime, the long-awaited Pan American service from San Francisco to New Zealand, when it starts on July 12, will give us an air-mail link between this "outpost of democracy" and our farthest "outpost of Empire." From New Zealand the trans-Tasman service is running regularly to Australia, and so the line of communication is complete.

We must be thankful to our American cousins that we are able to use their air services at a time like this, but the situation reminds us how urgent is our need to establish, on a firm basis and for all time, our own air routes all round the world as soon as the present war will allow us. The last instalment of Dr. Cox's lecture on civil aviation appears in this issue, and we can do no better than take the path he has indicated.

In the second instalment, published last week, he outlined the development work which must be done, and provided useful graphs on stowage volume which clearly indicated the field of size in which the all-wing aeroplane might be expected to appear. He also dealt with the question of landplane or flying boat.

In this concluding instalment Dr. Cox writes of the organisation needed for research and development, and also that very important subject, education. He has some things to say on the economics of aviation which we have never heard anyone else say, and they give one a brief glimpse of the work which is ahead. Every sentence of this lecture is packed full of valuable thought, and *Flight* has only been able to give a very-much-contracted version of the original. Those interested are urged to obtain a copy of the Journal of the Royal Aeronautical Society when the full paper is published.



Royal Canadian Air Force photograph.

A CHANCE FOR COMPARISONS. A Curtiss P-40 with 1,100 h.p. Allison engine and a Supermarine Spitfire with Rolls-Royce Merlin on the tarmac at Uplands Airport, Ottawa. After this picture was taken the two machines were flown together, the American piloted by an officer of the Royal Canadian Air Force, and the Spitfire by an officer of the U.S. Army Air Corps. The occasion was a visit to Canada by technical officers of the U.S. Army Air Corps. They flew from Dayton, Ohio, in a Douglas.

WAR in the AIR

Air Raids on Britain : Italy Raided : France Capitulates

THE first large-scale air raid on Great Britain took place on the night of June 18-19 (Tuesday-Wednesday), when some hundred or more German bombers crossed our East Coast. The moon was nearly at the full, and the night was exceptionally bright. The raiders spread out fan-wise, according to an Air Ministry announcement, and while some attacked the Thames estuary others apparently made for aerodromes of the R.A.F. No doubt this is to be taken as a delicate compliment to the work of our aeroplanes. The Germans would certainly like to curb the activities of the bomber squadrons which have been making havoc of parts of the Ruhr and other military objectives in Western Germany, and likewise they knew that their own raiding would be made safer if they could put some of our fighter aerodromes out of action. The damage which they did was not great. A number of bombs fell together on a row of two-storey houses in a working-class district of a town in Cambridgeshire. Nine people were killed in them and a number of others were injured. Houses in several villages were hit, and also a school. Altogether, twelve civilians were killed, including two or three elderly folk who died from heart failure, and thirty or more were injured. One bomb hit a pipe-line leading to an oil wharf on the Thames estuary and caused a fire, but it was soon extinguished. The attacks on aerodromes were not successful.

Our Fighters Active

THE defences were active, and as a result six bombers were shot down by fighters and one by A.A. gunfire, while several more were shot about and were unlikely to get home. As was to be expected, the fighters depended mainly on the searchlights to guide them to where the bombers were, but in the bright moonlight the fighters themselves were not invisible to the bomber crews, and in consequence two fighter Blenheims were damaged by enemy fire. One got a bullet through the petrol tank but was safely landed, while another was so shot about that the pilot had to come down in his parachute. Before he had to jump he had shot down his opponent. The bombers shot down were, so far as our information goes, all of the type Heinkel 111. The first success of the night fell to a Flight Lieutenant over the Thames estuary just before 1 a.m. He was on the ground when he saw a bomber caught in a searchlight at 8,000 feet, so he climbed at his best speed. In fact, he got two Heinkels within ten minutes. He gave the following account of the action:—

"I attacked from astern, closing to 50 yards and giving the enemy a four-seconds' burst," he said. "I saw my bullets enter the enemy aircraft and my windscreen was covered with oil. The enemy broke away and spiralled downwards out of the searchlight beams. I then climbed to where another enemy aircraft was illuminated at 12,000 feet and fired five two-second bursts. Heavy smoke came from the enemy and a parachute opened close to it. This aircraft also went down in a spiral dive."

Some of the Heinkels fell in the sea, others in Kent and East Anglia. A number of their crews came down by parachute and were taken prisoner. In one case a bomber shot down by a Spitfire off the south-east coast made a crash landing on the sands a few yards from a large new hotel. Three of its crew were unhurt, but a fourth, who had tried to make a parachute jump, had become entangled with the tail and was killed.

The next night, Wednesday-Thursday, June 19-20, the Germans came again in greater strength, and the raids extended up to the Scottish coast. A number of bombs were dropped on the north-east coast. Damage was done in three towns, but fires which were caused were all brought under control. Other bombs fell at scattered points in Lincolnshire, in the south of England and in South Wales. Eight civilians were killed and some sixty injured. Six people died from shock and heart failure.

This map shows the various areas in which R.A.F. bombers and fighters, as well as bombers of the S.A.A.F. and of Southern Rhodesia, have been in action against the Empire of Italy.

Three German bombers were shot down by Spitfire pilots during this raid. A fourth was disabled and is unlikely to have reached home. The night's successes were shared by three fighter squadrons, each of which has had active experience over France. The first came shortly before midnight, when a Heinkel 111 was disabled near the mouth of the Tees. A quarter of an hour later a pilot from another squadron made a head-on attack on an enemy bomber which had been picked up by searchlights near the Humber. The searchlight crew saw the bomber crash. An hour later a pilot from a third fighter squadron shot a Heinkel down in flames near Grimsby, while almost at the same time his squadron leader was destroying another Heinkel farther south.

Before dawn two local auxiliary coastguard patrols saw an aircraft, obviously in difficulties, off the coast. Flames were issuing from one of its engines, and it crashed in shallow water close to the beach. The coastguard men gave the alarm and ran to the beach. They intercepted the crew of the aircraft, a German Heinkel bomber, as they swam and waded ashore with the help of their rubber dinghy. It seemed at first that the crew of the Heinkel, consisting of four men, would show fight. The auxiliary coastguard men thereupon covered the Germans with their firearms, while one of their number gave another alarm. Thereupon the Germans shouted and surrendered to the auxiliary coastguard men. They were searched and disarmed and detained until the arrival of the military, who hastened to the scene on receipt of the alarm signal which had been passed on by the nearest coastguard station

WAR IN THE AIR (CONTINUED)

In this second raid the Germans concentrated more on industrial areas, and some damage was done to factories, but it was not serious. The night was cloudy and this favoured the raiders. On the other hand, the black-out was very effective. The raiders which reached South Wales dropped their bombs on waste land.

A third raid took place on the night of Friday, June 21, and bombs were dropped sporadically. Most fell in open country. Three people were killed in a Suffolk town, and three were injured elsewhere, one of whom died in hospital.

During these raids two German machines flew into cables of the balloon barrage and were destroyed.

German Munition Works

MEANTIME, the remainder of the B.E.F. and the Advanced Air Striking Force were withdrawn from France. Pending the result of the negotiations with Germany, the remnants of the French Army continued to resist, but without much cohesion or much hope. Despite this, the R.A.F. Bomber Command continued its attacks on the rear of the German Army and on strategical and munition centres in Germany itself. The Coastal Command took its share in the work. There have been heavy raids on Gelsenkirchen, Hamburg, Wanne Eickel, Essen, Dollbergen, Aachen, Duisberg, Rheydt, Cologne, Coblenz and other places. At Hamburg one of the largest oil storage plants in North-west Germany was hit, and a particularly violent explosion followed. An ammunition train was caught in a cutting near Cologne and hit by three heavy bombs. Bombers are particularly to be congratulated when they can wreck a train in the middle of a cutting, as it is then very difficult to clear the line. Altogether German towns have never been so heavily hammered within recent times, though our airmen have orders to confine their attacks to military objectives. Obviously, the destruction of such targets does more to help us on to winning the war than if we descended to the brutality of deliberately slaughtering civilians.

Our fighters, too, have not neglected Northern France. One day a section of three Spitfires met three Junkers 88 dive bombers between Boulogne and Le Touquet. One of the Spitfire pilots was lately awarded the D.S.O. The other two hold the D.F.C. Each Spitfire pilot took one of the Junkers. One was seen to crash into the sea. Another dived into cloud with flames pouring from its starboard motor. The rear guns of the third had already been silenced before the Spitfire pilot made his final attack.

The "Scharnhorst" Bombed

ON his way home from Northern France in the small hours of one morning, a Blenheim fighter saw a Heinkel 115 seaplane silhouetted far beneath him against the sea. He dived 9,000 feet to the attack, and after a ten-mile chase up the coast shot down the Heinkel in flames. After the first long burst from the Blenheim the Heinkel pilot dived to sea level. At the same time the Heinkel fired a rocket signal and dazzling white star shells lit up the sky above pursuer and pursued. The Blenheim closed for a second long burst, and the port engine of the Heinkel caught fire. As the Blenheim pilot broke away, his rear-gunner saw the Heinkel crash into the sea.

On Thursday, June 20, a squadron of Hurricanes on a patrol over Northern France sighted fifty German dive-bombers, Ju. 52s and Ju. 87s, parked in two long lines on Rouen aerodrome. The Hurricanes dived in line astern out of the sun and fired thousands of bullets into the bombers. Four were set on fire and our pilots estimated that they damaged twenty in all. In the afternoon a squadron of Blenheims visited the same aerodrome and did more damage. All our machines returned from both raids.

The Royal Navy have suffered a severe loss through the sinking of the aircraft carrier H.M.S. *Glorious*, together with two destroyers which accompanied her. She was a sister ship to the *Courageous*, which was torpedoed earlier in the war. Thirty-six officers and men from the carrier and one of the destroyers have been landed in this country by a Norwegian ship, and the Germans have stated that they have taken a number of prisoners. It is believed that the German ships which overpowered ours were the battleships *Scharnhorst* and *Gneisenau*. The Fleet Air Arm was prompt in taking a certain measure of revenge, for in a raid on German naval units in Trondjem fjord on June 13 they planted a heavy bomb abaft the funnel of the *Scharnhorst*, and possibly also obtained a second hit on the ship.

The *Scharnhorst*, heavily escorted by surface warships and 50 Messerschmitt fighters, was returning to a German port for repairs when she was sighted by a British submarine, which fired torpedoes and claimed a hit with one. The German fleet was shadowed for nine hours by relays of Hudsons and by a Sunderland. When the light became suitable for a bombing attack a mixed force of Beauforts and Hudsons went in. They were met by "an avalanche" of A.A. fire and five of our machines were brought down. Three direct hits on the *Scharnhorst* with heavy bombs were claimed. At the same time there was intense air fighting with the Messerschmitts, of whom at least two were shot down, one by the Sunderland, while others were seriously damaged.

A Stout Merchantman

THE arming of merchant ships has proved a considerable success, and their gunners have brought down not a few German aircraft which attacked them. One British merchant ship, attacked by German aircraft, performed the astonishing feat of shooting down two German aircraft with a single shot from its defensive gun. The chief officer of the ship, who was one of those who saw it happen, gave the following account: "I saw three 'planes attacking the

Italy is employing natives of Lybia in her parachute fighting organisation.

WAR IN THE AIR (CONTINUED)

ship. As they passed over to our port side, at a height of about 2,000 feet, our gunner fired his first shot. I saw the left-hand side 'plane split in a fore and aft line just abaft the port wing. She opened right out. The starboard wing fell into small fragments, and then it crashed to the ground. The shell seemed to pass through this plane and explode just ahead of the first of the two remaining 'planes. The nose of that second 'plane was lifted and I saw a piece of the fuselage fall off. Then the pilot baled out with his parachute, and as the plane glided down pieces of it were flying in all directions."

The War with Italy

THE war with Italy in the Mediterranean and Northern Africa seems, from the reports, to have been conducted by the British in a cheerful "tails-up" spirit. In addition to the South African Air Force the air squadrons from Southern Rhodesia (a very go-ahead Colony) have joined in, and the squadrons under Air Chief Marshal Sir Arthur Longmore have been hitting out right and left with great success. On several occasions they have co-operated with the ground forces, and the British armoured forces have scored several times in raids on Italian fortified posts and on mechanised and motorised Italian columns. The various tribes of Africans, Somalis, some Arabs, some Abyssinians, and others, which the Italians have enlisted or impressed have not shown much enthusiasm for fighting the British, and more than once have dispersed (to put it mildly) without putting up much of a fight. The Italians have continued to send bombers over Malta, but so far have done little damage and have lost a number of aircraft in the process. On two occasions mention has been made of British fighters shooting down Italian bombers off the island. It must, however, be anything but easy for air raid warnings to be given in good time in a small island when the raiders approach over the sea from bases not far away, and fighter patrols cannot always be in the air to meet them. They have to take off and climb, and it seems that the Italian machines rarely wait for the fighters to get to grips. However, on Saturday, June 16, and again on the 21st, fighters at Malta shot down enemy bombers. The latter was the occasion of the thirty-eighth raid on the island.

The Air Ministry has issued further accounts of the raids on aircraft factories in North Italy. Within 24 hours of Italy entering the war our bombers flew over the Alps through snow-storms and with ice forming on the wings, and glided down to the plains. For three hours the Fiat factory at Turin was intensively bombed, and little opposition was met. At Genoa the bombs were dropped on the Ansaldo works, where explosions occurred. The second raid was on the Breda factory a few miles north of Milan, where fires were started and explosions followed. The Caproni works, also near Milan, were likewise bombed.

A Raid on Alexandria

ON June 23 the Rome radio reported that the R.A.F. had bombed the seaport of Trapani in Sicily. The only important reposte by the *Regia Aeronautica* so far has been a raid on Alexandria on Saturday, June 22, at 1.30 a.m., when twenty bombs were dropped which killed two people and injured 23, or whom two were Italians. Little material damage was reported. Fighters went up, and two of the raiders were severely hit.

On Sunday, June 23, the French Government at Bordeaux, with Marshal Petain as Premier, signed the humiliating terms imposed by Germany. The French plenipotentiaries then went to meet the representatives of the Italian Government. The German terms will be familiar to all our readers. The Prime Minister expressed British feeling in a dignified broadcast message, and to that we can add nothing.

BOOK REVIEWS

"The Design and Construction of Flying Model Aircraft," by D. A. Russell (A.M.I.Mech.E.); 6s. 6d.; Harborough Publishing Co., Ltd.

MR. RUSSELL'S book, in its original form, was reviewed in *Flight* some time ago, but this, the second edition, has been greatly enlarged and brought right up to date. It covers every phase of model aircraft design and several chapters are devoted to airscrew and engine performance. The whole book is concerned with scientific calculation of design and many formulæ, obtained by wind-tunnel experiments, are given.

"Models for Flying," by L. H. Sparey and C. A. Rippon; 3s. 6d.; Percival Marshall and Co., Ltd.

THIS is a useful book for those who have already built one or two models. It describes in detail several more advanced methods of construction and instructions are given for making five models. Full sized plans of these can be obtained from the publishers.

The trimming of models for flight is dealt with in a separate chapter as are petrol-driven models. The book is, in fact, a comprehensive study of present-day model aeronautics.

"The Wonder Book of Aircraft," by Harry Golding, F.R.G.S.; 6s.; Ward, Lock and Co., Ltd., Salisbury Square, London, E.C.4.

INTENDED mainly as an introductory work for children this modernised volume of the "Wonder" series covers the ground quite thoroughly. Its many chapters deal with most aspects of flying and it is well illustrated with photographs and colour plates.

Many illustrations from previous volumes are retained and give the book a somewhat archaic air but there are few serious inaccuracies.

"Up and At 'Em," by Lieut.-Col. H. Hartney; 2.50 dollars. Published by Stackpole and Sons, Harrisburg, Pa., U.S.A.

THE author of this book commanded the First Pursuit Group of the American Air Force in the last war, and before that saw service with the R.F.C., so that his experiences are well worthy of record. He describes the activities of a fighter squadron in great detail and shows up many causes of needless waste and delay which, he considers, may easily occur again unless proper action is taken.

The careers of America's leading war pilots are woven into the story in an entertaining manner, and the chapter entitled "Our Aviation in the Coming War" is one which gives food for thought, having been written after the commencement of the present war.

"Our Air Force"; Ward, Lock and Co., Ltd., Warwick House, Salisbury Square, London, E.C.4. 3s. 6d.

MOST people nowadays are in some degree students of the R.A.F., but their interest is limited by lack of knowledge of the organisation and workings of the Service. This book gives, in simple language, a fairly detailed description of life in the R.A.F. and is well illustrated with photographs and drawings, sixteen of them in colour.

Although primarily a boy's book it may be found helpful to anyone requiring an elementary survey of the subject.

"To the Lost World," by Paul A. Zahl; 11s.; Harrap.

THOSE who remember Conan Doyle's "Lost World," will be interested in Dr. Zahl's account of his journey to the inaccessible tableland in the northern part of South America, known as Mt. Roraima, which served as the scene of Conan Doyle's imaginative story of pterodactyls and dinosaurs. As a researcher of the Haskins Laboratory, Dr. Zahl was hunting, not dinosaurs, but creatures nearly as fearsome but not so large, the two-inch long ponerine ants. On one occasion he broke a bottle containing 50 specimens, and was driven from his hotel bedroom, endured two hours of stinging agony and then returned to find one of the ants looking at itself in the dressing-table mirror.

Combined with the ant-hunting, there was the discovery of two astounding waterfalls, the scaling of the Lost World plateau in treacherous mists and observation of the habits of the local Indians. In all this work Dr. Zahl was aided by flights made in a small Ireland flying boat, and saw his country both from the ground and the air.

The EMPIRE AIR ROUTES

Effect of Italy's Declaration of War

ITALY'S declaration of war prevents the Empire air service following its usual route. In fact, at first it did more than that—it prevented the Empire air service running. A glance at the accompanying map shows the proximity of Italian territory to the Empire route and it was well known that this route would be abandoned as soon as Mussolini made an "axis" decision.

Accordingly, the morning after the declaration the Postmaster-General announced that the Empire air mail services had been temporarily suspended. The principal countries affected were Malta, Egypt, Palestine, Iraq, India, Ceylon, Burma, Hong Kong, Malaya, Australia, New Zealand, Sudan, East Africa, and South Africa. The Empire boats were taken off the route, and even the link from Hong Kong connecting with the Empire route and K.L.M. at Bangkok ceased operation. The severing of this link cut Europe off from any air communication, even indirect, with Australia, as no use could be made of the Pan-American routes across the Atlantic and Pacific.

K.L.M. Arrangements

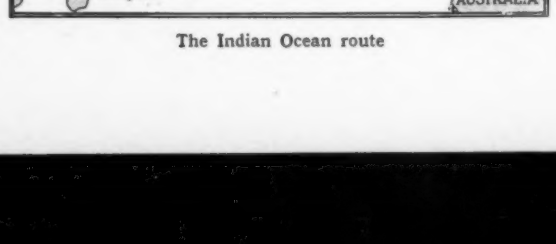
Italy's decision was not, of course, unexpected, and suitable precautions had been taken beforehand. British Overseas Airways have now recommenced a once-weekly operation of the flying boat route between Durban and Sydney via Kenya, Alexandria, Palestine, India and the East Indies. Qantas as usual will look after the Australian end. The New Zealand service, too, continues to run regularly across the Tasman. The regular London-Lisbon service via Bordeaux has been suspended since June 18, but contact is maintained by non-stop flights when required.

K.L.M. too, were not caught napping and several weeks ago shifted their maintenance depot from Naples to Lydda in Palestine. For three weeks prior to the declaration they had altered their time-table to eliminate the overnight stop in Naples and aircraft got in at 12.30 p.m. and were away again by 1.30 p.m. Their service will now run once weekly from Alexandria to Batavia and thence to Sydney, also once weekly, by K.N.I.L.M.

Another Way

In addition to the Durban-Sydney route, there is another possibility which would be a speedier route between England and Australia. This is the Indian Ocean crossing. Obviously there are several ways which may be taken to reach Mombasa, and once there, the long ocean crossing may be made to Australia, landing at Port Hedland on the coast of Western Australia or at Darwin in the north.

If the Indian Ocean route is to be used later, we must be thankful that it has already been surveyed, and the credit is due in the main to Captain P. G. Taylor for his foresight, energy and perseverance in continually pushing



The Indian Ocean route

This map shows how Italian territories threaten our normal Empire air route

this idea against the usual deadening inertia which is found blocking the way of every progressive activity. After years of advocating that the last big ocean of the world should be surveyed, he was presented last year with a magnificent opportunity when it was found possible to charter the Archbold Expedition's Consolidated flying boat *Guba*. The boat was secured after the completion of its work for this natural history expedition in New Guinea and the cost was shared between the Australian and British Governments.

The Indian Ocean Route

With Captain Taylor in charge for the Australian Government and with an Australian newspaper man aboard, the *Guba* was navigated and flown by her American crew and Captain Taylor from Port Hedland to Mombasa in four stages during June, 1939. The first stage to Cocos Islands was the only one on which everything did not go according to plan, but it was accomplished under complete control and with perfect safety. Weather prevented the final location of these small islands even though astronomical navigation had brought the *Guba* to their vicinity, and the crew wisely decided to fly to Batavia. With better weather, the flight to Cocos was made later with no trouble and the remaining three stages to Chagos, the Seychelles and Mombasa were completed subsequently.

The approximate distances involved in the Indian Ocean crossing are: Hedland to Cocos, 1,550 land miles; Cocos to Chagos, 1,760; Chagos to the Seychelles, 1,190; and the Seychelles to Mombasa, 1,060. The Empire boats are not capable of doing these great distances, but we have other craft avaliable.

And, if it is necessary, we have refuelling in the air which, thanks to Sir Alan Cobham and Mr. Langley, has been developed to a very efficient state and can be transferred readily anywhere in the world. Italy's declaration has not caught us unprepared and no day has passed since the beginning of the war without British air liners being in the air. It is of interest that recently the *Guba* has been offered for sale in U.S.A. complete with all its equipment (which is magnificent) and two spare engines. This seems to be a wonderful opportunity for British Overseas Airways to increase its depleted fleet with a very efficient boat.

ITALIAN SINGLE-SEATERS (CONTINUED)

centre part is a welded steel-tube structure and is built integral with the fuselage. The outer panels are built up from two box spars and duralumin ribs and the whole wing is covered with riveted duralumin sheet. Ailerons and trailing-edge flaps have fabric covering and metal frameworks and are interconnected, so that the whole trailing edge can be depressed.

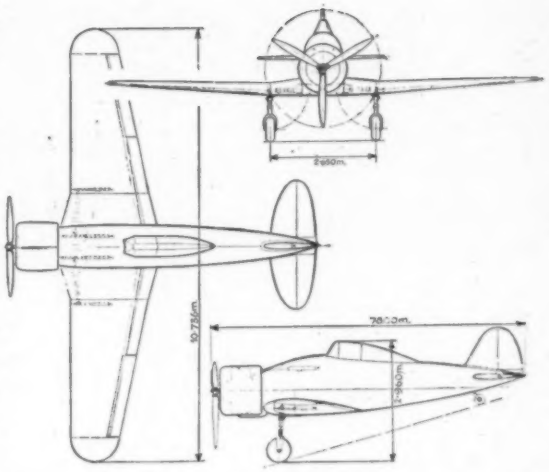
The fuselage is mainly a light metal monocoque but has a steel-tube forepart; the extreme tail is also built of steel tubes to simplify the mounting of the tail surfaces. The whole is covered with a stressed metal skin and the pilot's cockpit is enclosed by a large transparent fairing giving good visibility in essential directions. The tail unit consists entirely of fabric-covered metal frameworks.

Two cantilever oleo-pneumatic legs which carry medium-pressure wheels are retracted inwards into the centre-section by hydraulic gear from the undercarriage.

A Fiat A 74 RC 38 engine is fitted.

DATA

Span	35ft. 2in.
Length	25ft. 7in.
Wing area	197 sq. ft.
Weight empty	4,188 lb.
Useful load	947 lb.
All-up weight	5,135 lb.
Wing loading	26 lb. sq. ft.
Maximum speed	298 m.p.h.
Climb to 19,680ft.	7 min. 3 sec.
Absolute ceiling	35,400ft.



(Right) General arrangement of Fiat G.50. The optional wing guns are shown.

Macchi C.200

A single-seater monoplane fighter designed by Mario Castoldi, who was responsible for the M.C.72 record-breaking seaplane, the C.200 has its wings constructed in three parts — two outer panels and a centre section. These have spars and stressed skin covering of "Super-Avional." Flaps and ailerons are inter-connected so that the whole trailing edge can be lowered if required; the flaps are hydraulically operated.

The fuselage is an oval all-metal monocoque with a steel-tube engine mounting and a well-shaped transparent superstructure over the pilots' cockpit.

The tail unit is metal with fabric-covered control surfaces and an adjustable tailplane, the controls being operated by rigid push-pull rods instead of cables. The undercarriage (including the tail wheel) is fully retractable, the wheels being hydraulically retracted inwards into the centre section. Compressed air brakes are fitted to the wheels.

The Fiat A 74 RC 38 fourteen-cylinder two-row radial engine is used, driving a three-bladed Fiat-Hamilton constant-speed airscrew.

DATA

Span	34ft. 8in.
Length	26ft. 10in.
Wing area	180 sq. ft.
Weight empty	3,894 lb.
All-up weight	4,840 lb.
Wing loading	26.9 lb. sq. ft.
Maximum speed	313 m.p.h.
Climb to 19,680ft.	6 min. 30 sec.
Absolute ceiling	33,000ft.

For Learner Drivers

DESPITE the war old friends are still with us, and the sixth edition of "Motor Driving Made Easy" has recently been issued by *The Autocar*. As S. C. H. Davis points out in his introduction to this new edition, "it is the purpose of this book to achieve two objects. First, to impart in the simplest possible way knowledge of the art of driving a car in all conditions; second, to direct the learner's thoughts towards the acquisition of 'road sense.'"

A special war supplement is included dealing with lighting and other regulations, the problems of black-out driving and ways and means of making the petrol ration give the most miles. The price is 2s. 6d., or 2s. 9d. post free from Iliffe and Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

Long Distance in Australia

THE Royal Australian Air Force has of late been doing some real long-distance flying with its new Lockheed Hudsons. In April—news comes to us slowly from overseas these days with the air mail out of action—four Hudsons flew from Richmond, Sydney, across Australia to Perth in the day with only one stop. Proceeding independently but maintaining radio contact with one another, they flew to Ceduna on the Great Australian Bight, for refuelling, and then on to Pearce (W.A.). The distance is approximately 2,300 miles.

Another flight was made in the civil Douglas DC3 monoplanes which have been taken over by the R.A.A.F. (Four were taken over but one has since been damaged on the ground.) Leaving the R.A.A.F. station at Pearce at hourly intervals starting at midnight, the three machines proceeded non-stop to Brisbane, Sydney and Melbourne respectively.

Ricks as Obstructions

FARMERS have been asked to place their hayricks, whenever possible, in the middle of fields instead of at the edges in order that they may serve as obstructions for possible attempts of German aeroplanes to land. It is to be feared that in fields large enough to come into consideration, a good many hayricks would be needed, but is there any agricultural reason why farmers should not build smaller ricks and more of them?

A Handsome Gift

A GIFT of £50,000 by His Exalted Highness the Nizam of Hyderabad towards the maintenance of the two squadrons of the R.A.F. bearing his name is announced. In October last the Nizam presented the Air Ministry with a sum of £100,000 which was used in the equipment of a new fighter squadron now known as the Hyderabad Squadron.

During the last war a similar gift by the Nizam was used in the equipment of another squadron, and it is for the maintenance of these that the Nizam has now offered a further £50,000.

A message of appreciation has been sent by His Majesty the King to the Nizam, and on behalf of the Air Ministry another message has also been despatched. The second Hyderabad Squadron was formed in November, 1939. Its motto is: "Faithful Ally." The squadron, so far, has been responsible for shooting down two enemy raiders. Its pilots are from Britain and nearly all the Dominions.

Trans-Canadian Trophy

MAJOR M. A. SEYMOUR, President of the Canadian Flying Clubs Association, has been awarded the "Trans-Canada Trophy" for 1939 "in recognition of the outstanding leadership he gave to the flying clubs of Canada in 1939."

Major Seymour and other representatives of the Canadian Flying Clubs Association have been in frequent consultation with the Chief of the Air Staff and other officers of the R.C.A.F. in connection with the contribution of the 22 Canadian flying clubs to the promotion of the British Commonwealth Air Training Plan.

The Trans-Canada Trophy was donated by James Dalzell McKee, of Pittsburgh, as a memorial to the first trans-continental seaplane flight made in September, 1926, by Mr. McKee in company with Squadron Leader A. E. Godfrey, M.C., D.F.C., now an Air Commodore and Air Officer Commanding the Western Air Command.

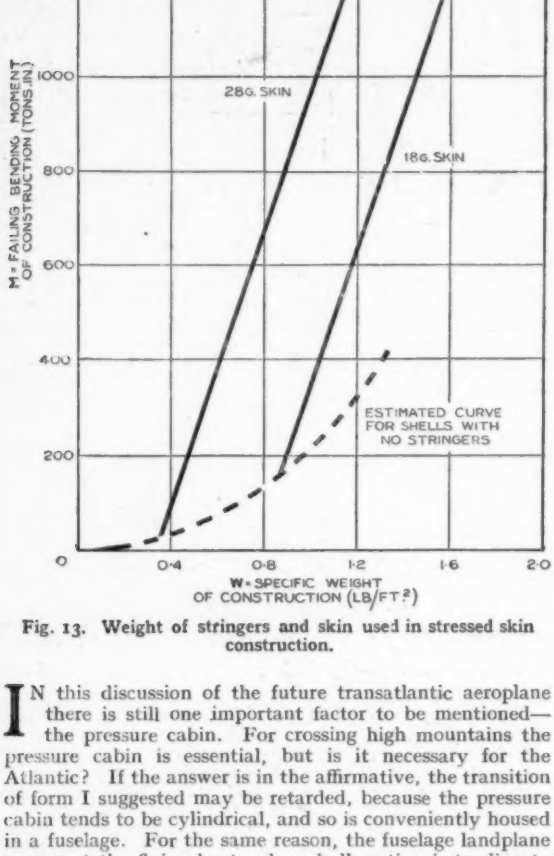


Fig. 13. Weight of stringers and skin used in stressed skin construction.

IN this discussion of the future transatlantic aeroplane there is still one important factor to be mentioned—the pressure cabin. For crossing high mountains the pressure cabin is essential, but is it necessary for the Atlantic? If the answer is in the affirmative, the transition of form I suggested may be retarded, because the pressure cabin tends to be cylindrical, and so is conveniently housed in a fuselage. For the same reason, the fuselage landplane may oust the flying boat, whose hull section is tending to be pentagonal. I consider that a transverse pressure cabin in the all-wing aeroplane would present no difficulty more serious than the main structural problem of the type, and that its walls would provide part of the structural strength.

Research and Development Organisation

The duties of the research and development section of the regulating authority are to solve the problems of the operators and constructors; to find out how to improve economy, comfort and performance; to assist the regulations staff to improve safety; and to anticipate the effects on safety of changes in design.

Before the war, civil research and development were not well served, for investigation was primarily directed towards military ends. Outside the airlines there was no organisation devoting any appreciable energy to the technics of civil aviation. Two bodies, almost microscopic in dimensions, concerned themselves with civil technical investigations in the time they could spare from regulatory duties. These were the Air Registration Board and the Department of Civil Research and Production of the Air Ministry. Compared with their half-dozen officers each is the safety and economic regulation staff of the Civil Aeronautics Authority, numbering 553 in September, 1939.

It seems to me that progress in civil technics would best be assured by the creation of a civil establishment for research. While civil and military work are both dealt with in the same establishments, the former is bound to suffer, as preparations for peace never seem so urgent as preparations for war. Duplication could be avoided by liaison between the civil and military staffs.

LOOKING FORWARD

Prolegomena for a Detailed Study of the Future of British Civil Aviation: The Wilbur Wright Memorial Lecture of the Royal Aeronautical Society

By H. ROXBEE COX, Ph.D., D.I.C., B.Sc., F.R.Ae.S., A.F.I.Ae.S.

(*Continued from page 552, June 20, 1940*)

Nature of Future Investigation

We accept as the general form of aircraft a combination of fuselage and fixed wings. The chief disadvantage of this form is the space it needs for taking-off and landing, which usually means that aerodromes are some miles from towns. There may be a field of activity here for craft able to take-off and land in a confined space. So we should continue to study rotating-wing aircraft and high lift devices. The other important type which should be rescued from obscurity is the tail-less aeroplane. A completely successful tail-less design would represent an advance in economy.

In aerodynamics the obvious problems are drag reduction, increase of maximum lift, stalling, stability, control. The possibility of maintaining laminar flow over surfaces holds out the hope of great advances either in speed at constant cost or economy at constant speed.

In structures a continual war against weight must be waged. Each increase in size must be accompanied by some structural ingenuity or the proportion of structure weight to total weight will increase. To meet these conditions we must investigate the effect of distribution of load on structure proportions, refine our present methods of construction and develop new ones. It is difficult to visualise anything but a smooth metal skin for the outside, but the basic structure may well be different from the arrangements of plate webs, transverse and longitudinal members now so familiar. Just as medium-sized bridges are plate girders while larger ones are frameworks, so I feel will the essential structure of the large aeroplane be a framework and some evidence of this is discernible. The curve shown in Fig. 13 is adapted from a paper by the late Mr. Gerard and shows the increase in economy as the skin is diminished in proportion to the framework. The great airships were all frameworks of a highly efficient kind.

A civil engine should be developed as military engines are not designed with the same objectives. The civil engine's chief attributes must be robustness, reliability, fire resistance, long life and fuel economy. These requirements by no means exclude the carburettor petrol engine, but the diesel has great potentialities in commercial work, and is of particular interest in combination with refuelling, which does not demand high take-off power. Its fuel consumption is appreciably lower and over long range this more than neutralises its greater weight per horse-power. The fire risk of the petrol engine can be considerably reduced by developing the direct injection type and using "safety fuels" of high flash point. Further ahead is the development of turbines for use in very high-speed aircraft.

Aerodynamic research may bring reactions on engine design. For example, if a serious advance towards laminar flow over wings is made, the designer will have to put airscrews behind the wing so that the slipstream shall not produce turbulence. For reasons of flutter prevention and centre of gravity, it will still be necessary to keep the

Fig. 14. The single-seater fighter Bell Airacobra is the outstanding modern example of shaft drive between engine and airscrew.

engine well forward, even though completely enclosed. Shaft drives are therefore indicated, and means of cooling which shall not disturb the laminar airflow. Shaft drives are not new—witness the Paulham-Tatin monoplane of 1911, the Westland F 7/30 biplane of 1934, the Dornier Do 18, and the Bell Airacobra. It is difficult to believe that their development will be unattended by troubles, and I foresee an extension of the admirable work that has been done on engine-airscrew vibration. In landplanes the pusher airscrew almost inevitably requires the tricycle undercarriage. In the seaplane, it probably means tilting engines (as in the Dornier Do 26) or tilting shafts.

Engine Size

Increase of engine size will reduce the number of units required and therefore the pilotage problem of handling a multiplicity of controls. But in the large aeroplane it is structurally desirable to spread the load over the span, and where the control is rather in the hands of a captain on his bridge than a pilot in his seat, difficulty is reduced. So on large aircraft we may expect a multiplicity of engines.

For a 200-ton craft we should need about 40,000 h.p. It is improbable that there would be room for more than eight airscrew discs across the span. If these are all tractors, or all pushers, then the possible solutions are eight 5,000 h.p. units, probably each driving a pair of contra-rotating screws, or 16 2,500 h.p. units, each pair driving a pair of contra-rotating screws. I would suggest that the latter is the easier problem and that for some time to come we might well be satisfied with 2,500 h.p. motors.

On aircraft instruments and equipment future work will inevitably be directed towards accuracy, convenience, lightness and compactness. More accurate height indicators and more intelligent automatic pilots are on the way. We may even some day get a true-speed indicator. Radio engineers will continue to improve the aids to navigation and landing. With their help we are trying to put the aeroplane on ethereal railway lines.

On aerodromes the future problems in this country are either architectural or else scarcely separable from aircraft design problems. We must try to get clear whether we need downhill runways or other means of assistance such as catapults or rail trolleys. Will the aerodrome designers be able to assume cross wind take-offs? Even the problem of aerodrome surfaces is related to aeroplane tyre pressures.

Education and Training

However carefully we may plan the organisation, and however successful we may be in obtaining the material facilities for its progress, success must always depend on having properly trained people engaged in it. In examining this matter we realise that the education of men for aviation must be conducted to a great extent without particular reference to civil or military aeronautics. Both are grounded on the same fundamental laws.

Technical progress depends upon the initiative, intelligence, energy, knowledge, skill and resource of the designers and research workers. Education can impart knowledge and skill, but the others are personal qualities. Aviation must ensure that it gets its fair proportion of men with these qualities. It can do this only by providing careers attractive intellectually and pecuniarily.

There should be a more widespread introduction of aeronautics into university curricula, as at present this tends to be rather a sideline. It is possible in the University of London to take aeronautics as one of the subjects of the degree in engineering, and courses are available at Northampton Engineering and Queen Mary Colleges. There is a post-graduate course at the Imperial College of Science and Technology, leading to the diploma. One of the most encouraging signs recently has been the decision of the University of London to institute a degree of Bachelor of Science (Aeronautics).

But no facilities exist in the majority of universities and university colleges. This is illustrated by the fact that there are only three professors of aeronautics, at the Imperial College, Cambridge University, and Hull University College. There are readerships in London University (Queen Mary College) and Glasgow University. It is not suggested that every university should have its aeronautical staff and laboratory. It is desirable, however, that every college teaching engineering should illustrate the fundamental principles by appeal to aeronautical examples as well as to civil, mechanical and electrical engineering; that applied mathematicians should be led from hydrodynamics to aerodynamics; and that physicists should be introduced early to airflow and aircraft instruments. If, in addition, students spent their vacations in aircraft works and were encouraged to make and fly gliders, they would have gained some knowledge of aeronautics on which to assess its attractions as a career.

There is a need for a coherent scheme of aeronautical education which would embrace the improvement of conditions of employment, relate the demand for and supply of talent, insinuate aeronautical ideas into general instruction, provide for advanced teaching, and elevate professional status. This Society, by the standards of its Associate Fellowship examination, by championing the idea of the engineering degree in aeronautics, by its lectures, by its encouragement of the student, has played already a great part in aeronautical education. There is no body better qualified to bring about the plan I have briefly sketched.

Apprenticeship Schemes

The universities will supply material for making designers and researchers, but the builders of aeroplanes need a different background. The man with the university degree may be well suited to a post in works management, but we shall not look to the university as the main source of supply. There have grown up a number of institutions, often connected with the apprenticeship schemes of firms in the industry, which, while providing elementary theoretical training, concentrate rather upon the manufacuring aspects of aeronautics. Their importance in the educational scheme cannot be overestimated.

We may expect for some time to come that the recruiting ground for airline pilots will be the Royal Air Force, but this training does not immediately fit a man for air transport duties. At the beginning of the war the general elevation of standards already noted in other branches of aviation was apparent also on the piloting side. The Guild of Air Line Pilots and Navigators and the British Air Line Pilots' Association in collaboration with the Air Ministry and the Air Registration Board, were engaged in raising the already high standard. The provision of the necessary knowledge is, in the cases of the companies forming the British Overseas Airways Corporation, in the hands of what might be called a post-graduate school of pilotage.

Civil aviation I regard as a necessity of commerce and as an instrument of prestige. Sometimes it is possible to develop a commercial necessity by purely commercial means and simultaneously achieve national prestige. I do not think that anyone believes that development on this basis is possible for British civil aviation, which must be dealt with as an essential Empire service.

Its speed brings more men together more often, and

enables them to transmit more quickly to one another their ideas, their orders, and their most valuable goods. The effect of this on imperial trade cannot be calculated. The commercial success of aviation has become less and less related to private pioneering enterprise and more and more the responsibility of the State. Prestige no longer comes automatically to us, and if foreign civil aviation has its States behind it, our trade and prestige will suffer unless our State is behind ours.

I have already given some idea of the things for which money is required but I will not venture to say how much they will cost. All that is certain is that a courageous act of reorganisation is required and "that for several years to come substantial help from public funds will be essential." The United States were faced with a similar task only a little while ago and their Federal Government did not hesitate to take drastic steps towards co-ordination and unification of control, steps which appear to be very successful.

Economics of Aviation

Whatever money is obtained for civil aviation, be it a lot or a little, must be well spent. The best distribution of money over the various branches of civil aviation is itself a problem for research. The other problems of economy in civil aviation seem to fall into two classes, economy in construction and economy in operation.

Among the former are the problems of the production engineer—the degree of special tooling proper to a given contract, the choice of easily obtained materials, the avoidance of complicated sections and joints. Problems of this kind appear to be capable of fairly precise definition.

The problems of economy in operation appear to be much more complex. Economy of operation is bound up with the route conditions—the terrain, the weather, the number of stops available, the size and nature of aerodromes, the class and volume of traffic. Given such data, it may be possible to work out the best speed of operation and whether one should use a large number of small aeroplanes or a small number of large ones. At present the method of making this sort of estimate is rough and ready, and I think that there is room for some economic research. I suggest that the civil aviation authority should include a small staff, charged with the duty of studying airline economics, which would collaborate with the operators, integrating their experiences, studying their income and expenditure accounts, and trying with the aid of statistical and probability theory to reduce airline economics to a science.

A most significant document is a report of the United States Maritime Commission on transatlantic costs. The commission found that air transport was likely in the near future to be operated at a cost equal to or possibly less than that of a marine superliner.

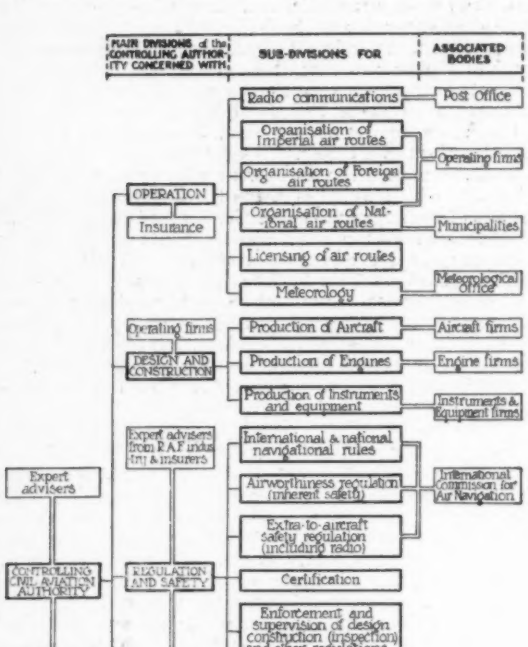


Fig. 15. Co-ordination of civil aviation control.

Operational Economics

The solution of a problem of operational economy for some particular route will generally include a set of minimum performance figures required of the operation aeroplane. The designer then has a problem in economics of a most complex kind. He has to produce the required performance in the most efficient way. To achieve an exhaustive solution, the effect of each characteristic or dimension of the aeroplane on other characteristics must be fully investigated. For example, decrease of aspect ratio will reduce wing structure weight but will increase induced drag. Increasing the thickness of the wing will also reduce structure weight and increase drag, but further effects of the change become apparent—the engine nacelles will have become less bulky relative to the wing, tending to reduce drag, while the junction area of wing and fuselage will have increased, tending to increase interference drag. Also stowage space in the wing is increased, which may allow the fuselage volume to be reduced. This effect also reduces drag and, perhaps, structure weight. The complexity of the problem is at once apparent.

I think there is a widespread belief that these complicated problems of design economy can only be solved as the result of the natural development of design over a period of years. General adherence to this thesis will mean that our designs will be consistently outpaced by those of more scientifically-minded folk. I suggest, in addition to the staff concerned with the economics of airline operation, a staff concerned with research into the economics of design.

Co-ordination

In the foregoing I have tried to give an idea of what has to be done; the organisation needed to do it is shown in the diagram of Fig. 15.

My diagram is intended to show in general terms the constituents of British civil aviation as related by a controlling authority in a simple scheme. In this diagram I have indicated the necessary collaboration between the components of the Empire. I have defined British civil aviation as Empire civil aviation. Australia, New Zealand, Great Britain, Canada, South Africa, India, must each have its own civil aviation problems which only its own organisation can control. But they have in common a world airline, and a common interest in its development. Australia, Great Britain and Canada have their own aircraft industries and aeronautical institutions, and planning for the future must take account of the distribution of all their products and the utilisation of their resources. I would hope, for example, that the airworthi-

(*Concluded on page 572d.*)

SERVICE AVIATION

Royal Air Force and Official Announcements

Empire Training

THREE more Elementary Flying Training Schools are to be established in Canada, bringing the number announced at present to 17. The schools will be at St. Catherines, Ont.; Degert, N.S.; and Cap de la Madeleine, Que.

Pigeon-keepers

A NEW trade—Pigeon-keeper—has been introduced into the Royal Air Force. The number of vacancies is limited, and only expert pigeon fanciers are likely to be accepted.

Indian Expansion

THE Government of India have decided to proceed with the training of 300 additional pilots and 2,000 mechanics for the purpose of creating a trained reserve for the Indian Air Force. Ninety of these pilots are already in training.

More Canadians

MORE Canadian airmen, the fourth contingent, have now arrived in this country. They have brought their aircraft and all their equipment with them, all the machines being Canadian built.

The men travelled in the charge of Wing Cdr. F. V. Beamish, R.A.F., and were welcomed by Air Commodore C. V. Welsh.

Canadian Promotions

THE following officers of the Royal Canadian Air Force are promoted to the rank of AIR COMMODORE: Group Capt. A. B. Shearer, Air Officer Commanding No. 2 Training Command; Group Capt. Harold Edwards, member of the Air Council for Personnel; and Group Capt. G. V. Walsh, M.B.E., Air Officer Commanding the Overseas Headquarters of the Royal Canadian Air Force.

Sqn. Ldr. Hugh Roland Stewart has been selected to fill the new post of Air Secretary in the Department of National Defence for Air. His duties will correspond to those of the Military Secretary in the Department of National Defence.

War Artists

THE Air Ministry has appointed Mr. Paul Nash and Mr. Keith Henderson as official artists of the air war, and Mr. Raymond McGrath is working on the various types of aircraft. Even the barrage balloons are being painted. Three artists, each of whom served in the last war—Mr. Eric Kennington, Mr. Henry Lamb and Mr. William Roberts—are drawing portraits of the Service Chiefs and other ranks.

When the war is over the pictures will be divided between the Imperial War Museum, the National Maritime Museum, and possibly other galleries which may have a claim to some of them.

Awards

THE KING has been graciously pleased to approve of the undermentioned awards which have been granted in recognition of gallantry displayed in flying operations against the enemy.

BAR TO THE DISTINGUISHED FLYING CROSS.

STRANGE, Pilot Officer Louis Arbon, D.S.O., M.C., D.F.C., Royal Air Force Volunteer Reserve.

P/O. Strange was detailed to proceed from Hendon to Merville to act as ground control officer during the arrival and departure of various aircraft carrying food supplies. He displayed great skill and determination whilst under heavy bombing attacks and machine gun fire at Merville, where he was responsible for the repair and successful despatch of two aircraft to England. In the last remaining aircraft which was repaired under his supervision, he returned to Hendon in spite of being repeatedly attacked by Messerschmitts until well out to sea. He had no guns in action and had never flown this type of aircraft previously, but his brilliant piloting enabled him to return.

DISTINGUISHED FLYING CROSS.

WIGHT, Flight Lieutenant Ronald Derek Gordon.

This flight commander has destroyed ten enemy aircraft, four of these being shot down whilst he was serving in France. During the numerous patrols on which he has been engaged he has displayed dash and outstanding qualities as a leader.

CHANGING THEIR SPOTS. American ex-navy aircraft ready for shipment to Great Britain after receiving their war paint. Note the auxiliary tanks located between the landing wheels.

BOYD, Acting Flight Lieutenant Adrian Hope.

Between May 20 and June 3, 1940, Flt. Lt. Boyd was engaged on offensive patrols almost every day. During this period he destroyed at least six enemy aircraft and severely damaged several more. This officer has displayed courage and determination, often attacking superior forces, and has pressed home his attacks in every case.

CROSSLEY, Acting Flight Lieutenant Michael Nicholson.

On June 8, 1940, this officer was the leader of two squadrons of fighters which were carrying out an offensive patrol in the Le Treport area. Flt. Lt. Crossley sighted seventeen Heinkel 111's, and displayed outstanding initiative and courage in his method of attack. As a result of the engagement seven enemy bombers were destroyed. Flt. Lt. Crossley himself destroyed two, and had to break off a further fight as his ammunition was expended. This officer had his first combat in May, 1940, when he succeeded in destroying a Messerschmitt 109. He has displayed exceptional skill and leadership and, since the middle of May, 1940, has destroyed seven enemy aircraft.

FERRISS, Flying Officer Henry Michael.

During two consecutive days in May, F/O. Ferriss shot down a total of four Messerschmitt 110's although heavily outnumbered. Later he shot down a further three Messerschmitt 109's. In these combats he has displayed outstanding ability.

WAKEHAM, Pilot Officer Ernest Cecil John.

During a period of nine days in May, 1940, P/O. Wakeham was engaged on offensive patrols almost daily. He has shot down two enemy aircraft and severely damaged at least two others. His fine fighting spirit was displayed on one occasion when he was stunned by a glancing bullet while attacking enemy aircraft. He recovered consciousness after his aircraft had descended 5,000 feet and returned to the attack. Later in the day he again engaged enemy fighters but was shot down. He landed safely between Ostend and Dunkirk.

KAY, Squadron Leader Cyril Eyton, O.B.E., Royal New Zealand Air Force.

This officer was captain of an aircraft ordered to attack important targets in the forests south of Bourlers and Baileux during a night in June. In spite of extremely difficult conditions, and in the face of severe opposition, he successfully bombed the objective, starting several fires which gave accurate direction to other aircraft of this sortie. He then descended to a low altitude and, again in the face of heavy opposition, attacked the woods with all his machine guns. Sqn. Ldr. Kay has conducted a number of operations in recent weeks and has shown daring, determination and outstanding ability.

BATT, Acting Flight Lieutenant Robert Hector.

In June, 1940, Flt. Lt. Batt was the pilot, and Sgts. Nevill and Spencer the observer and air gunner respectively, of an aircraft which successfully carried out a single aircraft reconnaissance. Throughout the whole operation the aircraft was flown at a height of less than 200 feet, and enemy troop concentrations were located and subsequently attacked. Flt. Lt. Batt successfully completed the mission in spite of intense anti-aircraft fire which severely damaged his aircraft. Sgt. Spencer was wounded during the operation but continued to use his gun, also making valuable visual reconnaissances. Sgt. Nevill, by his skilful handling of his gun, beat off an attack by three Messerschmitt 109s. It is believed that one was destroyed. This crew has taken part in eleven operational flights since May 10th, 1940, and they have at all times displayed courage and determination in the face of the enemy. Their excellent team work has largely contributed to the success of many of the missions entrusted to them.

HUGHES, Acting Flight Lieutenant John McCulloch Middlemore.

During a period in May, 1940, this officer led many successful raids. On one day an attack was made on an enemy column at Dippach. Four days later he successfully pressed home a bombing attack on an enemy position, although attacked by a strong force of Messerschmitt 109s, and by skilful manœuvring of his aircraft he enabled his air gunner to shoot down one enemy aircraft. Flt. Lt. Hughes has shown magnificent leadership as a flight commander, and, by his coolness and initiative, has maintained the excellent spirit and morale of all his flight personnel.

INGRAM, Acting Flight Lieutenant John Anthony.

During a period in May, 1940, this officer carried out numerous day and night raids against enemy positions, pressing home his attacks with courage and determination. On one of these raids he was attacked by a formation of Messerschmitt 109s, one of which he shot down with his front gun. As a flight commander he has set a splendid example by displaying courage, determination and gallantry of a high order.

DISTINGUISHED FLYING MEDAL.

DRUMMOND, Corporal James Anthony.

In May, 1940, this air gunner took part in a raid on an enemy column near Dippach, and in the face of intense anti-aircraft fire he added greatly to the success of the raid by the full use of his machine gun on enemy troops. On another raid his aircraft was attacked by a large formation of Messerschmitt 109s, Cpl. Drummond engaged the enemy fighters with great confidence and courage, and by his accurate fire shot down one and inflicted damage on others. His coolness and accurate fire in the face of repeated attacks were largely responsible for the safe return of his aircraft.

BURGESS, Leading Aircraftman Thomas Oakley.

In May, 1940, this airman was wireless operator air gunner of an aircraft engaged on a bombing raid on enemy troops. After the raid his aircraft was attacked by six Messerschmitt 109s. L. A/C. Burgess immediately engaged the fighters, shooting down one and possibly destroying another. In the engagement he received shrapnel wounds. He showed great courage and skill in the face of a superior enemy force.

EVANS, Aircraftman 2nd Class Edward Joseph.

In May, 1940, this airman was wireless operator air gunner of an aircraft which, while on a bombing raid, was attacked by a force of Messerschmitt 109s. Although heavily outnumbered, aircraftman Evans remained cool and withheld his fire until his gun could be used effectively. He shot down one enemy fighter and damaged others, causing them to break off the engagement. His courage and coolness in the face of heavy enemy opposition were largely responsible for the success of the raid and the safe return of the aircraft.

NEVILL, Sergeant Edward Greville.
SPENCER, Sergeant Alan.

These two sergeants are mentioned in connection with Flt. Lt. Batt's decoration.

Service Aviation

Casualties

Air Ministry Casualty Communique No. 35.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed.

The names of officers and airmen who lost their lives while flying in operations against the enemy appear under the heading "Killed in Action." The names of those who lost their lives in other forms of flying duty or through enemy action while carrying out non-flying duties appear under the heading "Killed on Active Service."

KILLED IN ACTION.—Angus, 40281, F/O. A. B., D.F.C.; Byatt, 627950, Sgt. J.; Claydon, 72984, P/O. A. J.; Gifford, 90188, Sqn. Ldr. P., D.F.C.; Griffin, 755893, L.A/C. H. G.; Harris, 623844, Sgt. L. E. T.; Kennedy, 632947, A/C.2 T.; Lowe, 581516, Sgt. F. A. G.; Morris, 41048, P/O. D. W. W.; O'Flaherty, 637032, Sgt. P.; Robinson, 651370, A/C.2 A.; Scott, 40852, P/O. E. W. S.; Shepherd, 41621, P/O. J. A.; Williams, 566298, Sgt. F.

WOUNDED OR INJURED IN ACTION.—Bagshaw, 37590, F/O. G. L. C.; Bell-Syer, 39266, F/O. H. B.; Cunningham, 812142, L.A/C. F. S.; Donald, 580608, Sgt. D.; French, 36129, F/O. D. J., D.F.C.; Lee, 34061, Sqn. Ldr. H. G., A.F.C.; Murphy, 532831, Sgt. P.; Orton, 39330, F/O. N., D.F.C.; Parker, 700590, Sgt. T. G.; Pike, 581242, Sgt. R. N.; Pleasance, 37914, Flt. Lt. H. P.; Robertson, 39295, F/O. S. A. F.; Rosier, 37425, F/O. F. E.; Spencer, 580466, Sgt. A.; Taute, 40764, P/O. K. D'A.; Waterhouse, 544953, Sgt. J. R.; White, 41510, P/O. B. E. G.; Wilson, 630349, Sgt. H. H.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Fields, 43257, P/O. A. H.; Smith, 812204, A/C.2 W. J.

PREVIOUSLY REPORTED "MISSING," NOW REPORTED "DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION."—Mackwerth, 40728, P/O. C. C. D.

MISSING, BELIEVED KILLED IN ACTION.—Barker, 563835, Flt. Sgt. G. T.; Bevan, 563098, Sgt. H. C. C.; Connell, 580913, Sgt. S. P.; Field, 535052, Sgt. F. J.; Kendrew, 624417, Cpl. A. G.; Mackrell, 751949, L.A/C. J. F. W.; Roots, 36202, P/O. R. W.; Twamley, 580573, Sgt. A. E. D.; Williams, 562632, Sgt. J. D. F.

MISSING.—Adams, 630069, A/C.2 J. C.; Arderne, 40658, P/O. P. V.; Atack, 631239, A/C.1 D.; Atkins, 751819, L.A/C. J. F.; Axford, 515590, Sgt. J. L.; Bomford, 37712, F/O. C. P.; Bowman, 580756, Sgt. R. A.; Boyle, 618097, L.A/C. W. D.; Bridge, 620409, A/C.1 J.; Brown, 565062, Sgt. J. F.; Brown, 563611, Sgt. R. J.; Browne, 33222, Flt. Lt. P. E. S. F. M.; Buckland, 741093, Sgt. F. E.; Burke, 26100, Sqn. Ldr. W. I. H.; Burt, 751689, Sgt. B. W.; Cherrington, 42589, P/O. G. L.; Chouler, 580944, Sgt. M. R.; Clawley, 533480, Sgt. G. W.; Cochrane, 903064, L.A/C. R. D. K.; Coleman, 43692, P/O. J. H.; Cooper, 580606 Sgt. J. H.; Crozier, 626073, Sgt. F.; Deacon, 41906, P/O. A. H.; Dearden, 41677, P/O. C. H.; de Labouchere-Sparling, 41990, P/O. F. A. G. F. J.; Dodd, 530700, L.A/C. R. C.; Dolan, 902515, A/C.2 J.; Downham, 580712, Sgt. E. A.; Dunford-Wood, 40215, F/O. H. D. S.; Dunn, 39508, F/O. J.; Eadie, 550790, Sgt. R.; Edmonds, 39971, F/O. J. D.; Elliott, 564608, Flt. Sgt. J. W.; Embry, 09252, Wing Cdr. B. E., D.S.O., A.F.C.; Falkus, 41004, P/O. H. E. L.; Fevez, 42746, P/O. D. G.; Field, 26158, Sqn. Ldr. D. B. D.; Fitzgerald, 581507, L.A/C. A. V.; Flynn, 520659, Sgt. D.; Foreman, 625686, Sgt. T. A.; Franks, 26053, Sqn. Ldr. A. L., A.F.C.; Furby, 537429, Sgt. W.; Garcka, 580425, Sgt. J. E.; George, 40296, F/O. R. T.; Gough, 740435, Sgt. T. A. H.; Gray, 43166, P/O. W. A.; Greenwell, 41284, P/O. C. E.; Griffiths, 543756, Sgt. A. K.; Hare, 76908, P/O. C. J. F.; Hargrave, 580775, Sgt. R. C.; Haydon, 39663, F/O. F. J.; Hayman, 564713, Flt. Sgt. M. W.; Hillman, 565993, Sgt. S. A.; Holman, 740337, Sgt. S. H.; Houston, 745977, Sgt. J.; Irwin, 564214, Sgt. C. A.; Jackson, 90754, P/O. T. C.; James, 77464, F/O. B. B.; Jones, 566209, Sgt. E.; Jones, 744999, L.A/C. E. J.; Kerr, 581286, Sgt. I. L.; Kirkcaldie, 72526, P/O. K.; Knight, 581515, Sgt. J.; Lang, 523561, Cpl. G. E.; Legard, 34045, F/O. W. E.; Liddle, 626659, Sgt. D.; Little, 90364, F/O. T. D.; Livingston, 562187, Sgt. A.; Lockett, 41038, P/O. P. V.; McCoy, 903300, L.A/C. A. O'N.; McKenzie, 40405, P/O. R. C. D.; MacLagan, 551673, Sgt. D. R. C.; McLean, 523836, Sgt. J.; McMurray, 965010, A/C.1 J.; Mansel, 561305, Sgt. G. D.; Masters, 42249, P/O. J. G.; Miller, 364705, Sgt. F., D.F.M.; Moffat, 77921, P/O. R.; Moffat, 580973, Sgt. R. C.; Orland, 629336, L.A/C. E. R.; Ottewill, 565387, Sgt. P. G.; Owen, 90070, Acting Flt. Lt. J. S.; Paddon, 28097, Sqn. Ldr. B.; Paul, 565232, Sgt. E. H.; Perry, 581034, Sgt. J. L.; Peters, 552082, Sgt. D. E.; Peacock, 33067, Sqn. Ldr. G. E., D.F.C.; Peacock, 90124, Flt. Lt. M. F., D.F.C.; Piercey, 564983, Sgt. J. L.; Potts, 40941, P/O. I. G. G.; Purves, 549286, Cpl. R.; Rawlinson, 40851, P/O. M. H. G.; Rice, 741422, Sgt. D. J.; Robertson, 41618, P/O. G. P.; Rosewarne, 40021, F/O. V. A. W.; Salvage, 580529, Sgt. V. C.; Shepley, 37577, Acting Flt. Lt. G. R.; Simmons, 39344, F/O. R. C.; Spencer, 755611, L.A/C. D. D. G.; Stevenson, 42158, P/O. J. W. B.; Thomas, 619032, Sgt. D. R. I.; Thompson, 581052, Sgt. A. C.; Thompson, 551783, L.A/C. C. W.; Thompson, 755768, Sgt. G.; Thornley, 90398, Flt. Lt. L. T. W.; Treacy, 37617, Acting Flt. Lt. W. P. F.; Tucker, 581420, Sgt. E.; Vernon, 36145, F/O. J. E.; Watson, 41637, P/O. P. V.; West, 41972, P/O. R. A.; Wilkinson, 40038, F/O. W. C.; Wilson, 75684, P/O. Sir A. T., M.P.; Wilson, 90338, /FO. J. K.; Wilson, 73014, P/O.R.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Collings, 77726, P/O. C.; Hunt, 549999, L.A/C. L. J.; Lawson, 521169, Cpl. R. C.; Lockwood, 520825, L.A/C. A.

KILLED ON ACTIVE SERVICE.—Armstrong, 745102, Sgt. T. L.; Ashby, 745699, Sgt. K.; Ashton, 42476, P/O. S. W.; Bennett, 620296, A/C.2 H. B.; Boulton, 636888, A/C.2 S.; Buller, 42391, P/O. A. J. S.; Craven, 581207, Sgt. D. J.; Crossman, 72073, P/O. T. E. S.; Davison, 751270, L.A/C. G.; Follows, 745098, Sgt. G. T.; Hallam, 621765, A/C.1 R. W.; Hurley, 522985, L.A/C. S.; Hutcheson, 79161, P/O. G. A.; Jones, 545400, L.A/C. R. P.; Kay, 742168, Sgt. P. F.; Lamont, 552634, A/C.1 R. R.; Lawson, 754143, Sgt. R. S. C.; Lefeaux, 754575, Sgt. J. M.; Lewis, 547112, L.A/C. P. A.; Mackenzie, 90861, P/O. D. K. A.; Macmillan, 755622, A.Sgt. A.; Morehen, 742034, Sgt. J. S.; Mould, 531169, Cpl. E. M.; Nicholson, 70501, F/O. J. F.; O'Driscoll, 580125, Sgt. A. D. F.; Pelling, 749497, L.A/C. M.; Raper, 548176, Sgt. B.; Revell, 514831, Sgt. E. A.; Sigley, 36276, P/O. P. K.; Simpson, 42444, P/O. B.; Smith, 618641, A/C.1 B. B. C.; Stephens, 580772, A.Sgt. G. M.; Thomson, 36264, P/O. B. P.; Weir, 754918, Sgt. T.; Wheeler, 747805, A.Sgt. W. H.; Williams, 37953, F/O. E. T., D.F.C.; Wilson, 629500, A/C.2 R.; Wilson, 581485, Sgt. W. J.

WOUNDED OR INJURED ON ACTIVE SEAVICE.—Carman, 546155, A/C.1 E. H.; Ansell, 358284, L.A/C. C. A.; Du Vivier, 741241, P/O. R. A. L.; Evans, 552737, A/C.2 T. E.; Macaskill, 560677, Flt. Sgt. R. W.; Pannell, 741600, Sgt. E. G.; Parsons, 1150586, A/C.2 W. J. F.; Pettit, 36272, P/O. N. C.; Price, 516120, Sgt. A.;; Roberts, 648217, A/C.1 F.; Thurrell, 70677, Flt. Lt. C. C.; Willis, 580472, Sgt. J. S.; Wood, 745575, Sgt. J. M.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Bell, 41653, P/O. B. E.; Blanchard, 341016, L.A/C. F.; Chalmers, 33305, F/O. A.; Gray, 628224, A/C.1 R. C.; Lay, 535739, L.A/C. W. H.; Nutter, 986799, A/C.2 F. W.; Sumpter, 903630, A/C.2 S. T.

DIED ON ACTIVE SERVICE.—Adams, 908974, L.A/C. D. N.; Carpenter, 954802, A/C.2 A. G.; Cartwright, 535038, L.A/C. C. H.; Foy, 983562, A/C.2 W. H.; Davis, 613079, A/C.2 S. P.; Glover, 535000, A/C.1 W.; Haines, 545488, A/C.2 F. R.; Hamilton, 546766, L.A/C. D.; Hobson, 528329, L.A/C. R. A. D.; Knowlton, 900320, A/C.2 D.; Lewis, 550668, L.A/C. C. T.; Mountain, 939990, A/C.2 G. M.; Passey, 627956, A.Cpl. W.; Phar, 963359, A/C.2 W. F.; Scott, 630665, A/C.2 R.; Spirrell, 524121, L.A/C. W. J.; Wilson, 807066, Cpl. J.

PREVIOUSLY REPORTED KILLED IN ACTION, NOW REPORTED PRISONER OF WAR.—Skelton, 29147, Flt. Lt. G. F. A.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Barber, 546762, L.A/C. L. J. R.; Bowles, 564563, Flt. Sgt. T. W.; Bros, 633782, A/C.2 E. H.; Collyer, 539279, Cpl. A. C.; Crews, 37795, F/O. C. A. R.; Flower, 581174, Sgt. W. L.; Glandinning, 552111, A/C.1 H. D.; Glover, 41843, P/O. J. T.; Holloway, 620475, A/C.1 T. W.; Matthews, 40003, P/O. A. W.; Mullins, 41865, P/O. E. R.; Nicholson, 620766, L.A/C. J. R.; O'Brien, 40419, P/O. D. G.; Pepys, 25125, F/O. S. G. L.; Raper, 525318, Sgt. G.; Robinson, 632800, A/C.2 S.; Robson, 564766, Sgt. F.; Spencer, 618586, A/C.1 F. T.; Taylor, 36153, P/O. H. H.

Production Forges Ahead

LAST week the Minister of Aircraft Production announced that since May 10, the day on which the *Blitzkrieg* started, aircraft production at home in every category had exceeded the casualty list, including those sustained through accidents at home. "The aircraft available of every type now in use," Lord Beaverbrook continued, "exceeds the number of machines at the disposal of the R.A.F. when the battle broke out. In addition to production, repairs have replenished stocks. There is now on hand a very good surplus stock of engines. The public should give thanks for this immense effort to all the aircraft factories and engine shops and their workers, who have striven by night and day, without time off for recreation, without any regard for the pleasures and amenities of life. Their conduct is beyond praise."

Annual American Production

WHILE the daily Press gives headlines of the numbers of aircraft purchased from America—ordered from America would be a better phrase—and after-dinner speakers talk easily of aircraft production in terms of thousands per year, it is interesting to see the figures for American production given by Brig. Gen. H. H. Arnold, Chief of the Army Air Corps, in testimony before the House Appropriations Committee last March and just made public by our contemporary, *American Aviation*.

Military and heavy commercial aircraft made during 1939 in U.S.A. totalled 2,404, being 2,141 military and 263 heavy commercial. Exactly what constitutes "heavy commercial" is not defined. A total of 3,715 other commercial types were also produced, making a total number of aircraft manufactured of 5,856 for the year.

The figure for January, 1940, is 320 military craft as against 143 for the same month in 1939, so it is evident that there has been some acceleration. But the full magnitude of the task implied in getting up to the figure of 50,000 per year recently spoken about by President Roosevelt is evident.

Bendix-Stromberg Injection Carburettor

THE injection carburettor designed and built by Bendix-Stromberg and applied by the Pratt and Whitney Company to their engines, is now being fitted to 30 Twin Wasps ordered by United Airlines, who have been flight-testing the new carburettor for over a year. Characteristics claimed for the design include:—

1. Automatic regulation of mixture regardless of altitude, air temperature or engine output.

2. Full power may be taken from the engine with the mixture selector in any position. The mixture automatically enriches to the required value for take-off and emergency operation even though the mixture selector remains in the cruise position.

3. Practical elimination of the ice hazard, since it is only under extreme icing conditions that there is any tendency for ice to collect in the carburettor; in such instances, 40 or 50 degrees of carburettor air temperature will eliminate this possibility.

4. At present manifold pressure is not automatically regulated; the engine must be regulated by the throttle at all times.

North Atlantic Anniversary

ON May 20, 1940, Pan American Airways marked the first anniversary of their transatlantic air service. It was on this date last year that the first Clipper left New York for Lisbon and Marseilles, carrying mail across the Atlantic on a regular schedule. Since the service was started Pan American Clipper ships, on bi-weekly schedules, have crossed the Atlantic 152 times, have carried more than 2,774 passengers and over 234,000 pounds of mail. The aeroplane-miles flown during this period total 566,900, and passenger-miles 7,588,000.

Following the inauguration of the air-mail service to Marseilles on May 20, the airmail service between New York and Southampton was started on June 24. On June 28 a Pan American Airways Clipper carried passengers on the New York-Marseilles route for the first time, and on July 8, 1939, the passenger service from New York to Southampton was flown for the first time. Since the outbreak of war the Clippers have been operating to Lisbon.

RETURN to an OLD LOVE

Sikorsky Designs and Demonstrates a Successful Helicopter

By H. W. PERRY

DEMONSTRATION flights of an experimental helicopter designed by Igor I. Sikorsky and built by the Vought-Sikorsky Aircraft Division of the United Aircraft Corporation, at Stratford, Conn., U.S.A., were made at the factory on May 20. Piloted by the designer, the machine rose vertically about 30ft., hovered motionless over one spot, flew approximately 200ft. across the field, and descended vertically to a landing. In several short flights the ability of the craft to move in any direction and to turn in flight under full control was fully proved.

After the flights, Mr. Sikorsky said that they demonstrated a successful solution of the problems that have balked helicopter designers from the earliest days of heavier-than-air flying machine development. This is the third helicopter designed by him, the other two having been built in Russia about thirty years ago, and is the first of them to be flown successfully. It is a direct-lift, power-driven rotary-wing machine in which the power plant, rotor locations, and transmission and control systems were chosen with the purpose of testing specific basic principles.

As shown by the photograph, the uncovered fuselage is of trussed tubular construction of generally conventional design, except for the tail structure and location of the power-plant behind the pilot's cockpit. There are no fixed lift and control surfaces, such as wing, ailerons, stabiliser, elevator and rudder. Instead, a 75-h.p. four-cylinder opposed Lycoming engine drives a three-blade rotor of 28ft. diameter by means of a vertical shaft at a speed of 155 r.p.m. and also drives three auxiliary 6ft. 8in. rotors at the rear end of the fuselage. Two of the latter are rotated by vertical shafts mounted at the extremities of a transverse outrigger, and the third by a horizontal shaft disposed transversely to the longitudinal axis of the craft at the extreme rear end of the fuselage.

Pitch of the blades of all the rotors is variable, and the shaft of the main rotor can be tilted slightly in any desired direction from vertical. The most important feature contributing to successful control of the machine is the mechanical interconnection and synchronisation of the four rotors. Ascent and descent are controlled with precision by a left-hand stick that alters the blade pitch of the main and lateral auxiliary rotors. Motion in the air in any desired direction is controlled by the main control stick, which governs inclination of the main-rotor shaft, and by pedals that vary the pitch of the rearmost vertically disposed rotor, which acts as a rudder and also compensates torque of the main rotor. Variation of pitch of the two horizontal auxiliary rotors in the same direction produces longitudinal control, while variation in opposite directions gives lateral control.

Most of the lift is provided by the main rotor, the blade-tip speed of which at the most effective pitch is from 250 to 300 m.p.h. whether the machine is hovering or moving forward. An over-running mechanism permits autorotation of the main and two auxiliary rotors in event of stoppage

TESTING THE CONTROLS. Mr. Igor Sikorsky makes the first ascent on his new helicopter. Note that the machine is "tethered." Subsequently several free flights were made.

of the engine, so the craft can be controlled in a slow descent to a safe landing in a very restricted space with the engine dead, as all controls are independent of motion of the machine and are effective at any engine power or with no power if the rotors are turning. Thus the machine is a true helicopter with the added advantage of free turning of the rotors by air impact as in the autogiro.

The pilot, if sitting with the cockpit uncovered, is protected from the rush of air in forward flight by the strong downward slipstream from the main rotor.

Gross weight of the helicopter is 1,150 lb., power loading 15.3 lb./h.p., and main-rotor-blade loading 51 lb./sq. ft. average.

Information already gained from this experimental model shows, according to Mr. Sikorsky, that it will be readily possible to build a two-place helicopter powered with an engine of approximately 200 h.p. that will have the following characteristics:—

Ability to take off and land vertically in small spaces among buildings or trees;

Initial rate of climb in excess of 1,000 ft./min.;

A ceiling of more than 12,000ft.;

Forward speed from zero to slightly more than 100 m.p.h.;

Normal cruising speed of 100 m.p.h.;

Lateral and backward speed of 25 m.p.h.

Controllability of attitude and movement in all directions at all engine speeds and with engine dead.

The many fields of usefulness for such a machine for military, commercial and private purposes will occur at once to anyone familiar with aviation and the aircraft industry. The United Aircraft Corporation has not, however, indicated its intention regarding further development and production of the design. But design of the VS-300, as the experimental craft has been designated, is based on simple, sound mechanisms that are easily adaptable to mass production and which lend themselves readily to construction of a machine which will be reliable and safe in operation and simple to maintain. It is to be hoped that further development work will be undertaken.

Soviet Parachute Competitions

THE Presidium of the Central Council of Osoaviakhim (Soviet Society for Air and Chemical Defence) has approved the programme for the All-Union competition of parachutists, to be held in honour of the tenth anniversary of parachuting as a popular sport. The events will take place near Moscow from July 18 to 26. Participating in them will be the winning teams in the local test parachute competitions held in the different Union republics, and the winning teams of the Civil Aviation Fleet. Each team will consist of five parachutists and a parachute-packer.

The programme includes individual and team events for accuracy of landing in a circle of 100 metres radius and jumps with delayed pulling of the parachute cord. Crack parachutists will compete for accuracy of landing both by day and night. The programme also includes a competition for proficiency in the folding of parachutes.

Across Canada

TRANS-CANADA AIR LINES, the publicly-owned transcontinental airway, plans to institute a 13-hour Vancouver-New York service by the spring of 1942, using the latest type of Boeing 307 Stratoliners. With such a service the Canadian line would provide stiff competition to the present United States transcontinental services. The 33-passenger pressure-cabin Stratoliners have been selected because of the high altitude flying required at the western end of the trans-Canada route. Between Lethbridge, Alberta and Vancouver, the Canadian Rockies tower 12,000 feet and more, with the lowest pass, Crow's Nest, at 11,000 feet above sea level. During winter months planes have to operate above 12,000 feet and often go as high as 17,500 feet to miss storms. At present oxygen masks are provided for passengers and crews but the pressure cabin will eliminate this.

It was the Boeing president, Philip G. Johnson, who put Trans-Canada Air Lines on its operating feet. The use of these planes is expected to make possible flights straight across the Great Lakes, instead of as at present circling the lakes to the north, thus eliminating some 350 miles from the transcontinental route. Favourable exchange due to the war is expected to play a part in bringing United States transcontinental business to the Canadian line.

The Parachute in Peace

DESIGNED originally to save life, this generation has seen the parachute adapted to the purposes of warfare, but at the same time another civil use is being made of it for putting out forest fires in U.S.A., it is reported in *The Intava World*.

The prospect of doing a parachute-jump over forest country, and forest country that is on fire, seems a terrifying one, but successful experiments which have been made by the U.S. Forest Service in the Chelan National Forest, Washington, showed that suitable equipment reduces the risk to something consistent with the hazardous nature of all fire-fighting work.

The objective is to land a man at the site of a fire while it is still small and provide him with fire-fighting tools, rations, a first-aid kit and a lamp. The jumper is clad in a two-piece suit of strong duck, padded where necessary with felt, and his face is covered with a wire mask. At the first approach to the fire, a test parachute is dropped to determine drift; at the second, the fire-fighter descends; while, on the third, a burlap parachute is released to carry down his equipment and rations. The equipment parachute carries a long yellow streamer to aid in finding it.

The harness used has been specially designed for forest landings, as frequently the jumper is suspended in the harness when the canopy catches in the trees. The usual design of harness was found to cause so much pressure on legs and chest that the release could not be operated.

The experimental jumps, in which nobody was injured, showed that landing in pine plantations was preferable to landing on rough ground and that the jumper either went right between the trees to the ground or else was suspended by a firmly-caught canopy. In the latter case the rope, carried in a packet in one trouser leg, allowed him to reach the ground safely. It was also found, strangely enough, that the canopies were rarely torn. A 30ft. parachute has been used in this work and is equipped with two flaps operated by guide lines for steering. Its rate of descent is about 12ft. per sec.

Aircraft have for long been used in fire-fighting in many countries, chiefly for locating fires, but the U.S. Forest Service also uses them for dropping fire-retardent chemical bombs on small fires and for directing land parties to the scene of fires by loud-speakers. It is reported that these loud-speakers can be heard over a radius of 1½ miles.

Examinations for Navigators' Licences

AN examination for Second Class Aircraft Navigators' Licences will be held at Bristol, commencing on Monday, July 29, 1940, and concurrently at the recognised centres abroad.

Applicants residing in the United Kingdom who wish to attend the above examination should notify their intention without delay to the Director-General of Civil Aviation, C.H.5(e), Air Ministry, Julian Road, Bristol, 9. The applicant will then be supplied with an application form, and a copy of the latest edition of Air Ministry Pamphlet 44, containing details of the revised syllabus and conditions of the examination.

Applicants residing abroad should notify their intention without delay to the appropriate authority of the following; The Director of Civil Aviation, Singapore, Straits Settlements; The British Civil Aviation Department Representative in Egypt, Airways House, 3, Rue des Fatimites, Alexandria, Egypt; The Air Officer Commanding, British Forces in Iraq, Air Headquarters, Habbaniya, Iraq; The Air Officer Commanding, Royal Air Force Mediterranean, Valletta, Malta; The Director of Civil Aviation in India, Department of Industries and Labour, New Delhi, India.

The formal application must be returned to the appropriate address not later than June 27, 1940.

First Class Licences.

Provided there is a sufficient demand, an examination for First Class Aircraft Navigators' Licences will be held at Bristol in September, 1940, and at recognised centres abroad. Applicants who wish to attend should notify their intention as soon as possible to the Director-General of Civil Aviation, C.H.5(e), Air Ministry, Julian Road, Bristol 9, or to the appropriate overseas authority.

HERE and THERE

Trans-Pacific Service

PAN-AMERICAN AIRWAYS have announced that a weekly service will begin on July 12 between California and New Zealand. The terminal cities will be San Francisco and Auckland, but the route is not defined.

A Stanley Spooner Scholarship

BY the will of Mr. Stanley Spooner, founder of *Flight* and *The Auto*, the Royal Aeronautical Society is to receive £5,000 to be devoted to a Stanley Spooner scholarship for aeronautical research, a subject in the importance of which he had great belief. Incidentally, attention is called to an announcement in this week's issue, offering for sale a number of bound volumes of *Flight*, which were Mr. Spooner's property and which some of his many friends might like to secure as a lasting remembrance.

Accident in Canada

MR. NORMAN ROGERS, the Canadian Minister of National Defence, who was killed on June 10, met his death in the crash of an R.C.A.F. Lockheed Hudson aircraft, en route from Ottawa to Toronto. The plane crashed into the woods ten miles west of Port Hope, Ontario, and caught fire. The pilot of the aircraft, Flying Officer Cotter, and two members af the crew, Aircraftmen Brownfield and Nesbitt, were also killed. The cause of the accident has not been determined.

More Gifts

SINCE the various gifts of money for the purchase of aircraft were announced in *Flight* last week, further contributions have been received. They include £21,000 as a first instalment from the people of Trinidad and Tobago; £5,000 from the St. Vincent Arrowroot Association, West Indies; £5,000 from Mr. Leslie W. F. de Saram, a Ceylon solicitor, and his wife; and £30,000 subscribed by the residents of Georgetown, British Guiana, in five days.

Aircraft Factory Protector

A RECENT announcement by the Ministry of Aircraft Production was the appointment of Admiral Sir Edward Evans ("Evans of the Broke") "to take charge of the local protection and security of the organisation of all factories engaged on aeronautical work and the aerodromes attached to them." The announcement is somewhat curiously worded, but the general idea is sound enough. One might remark that May, 1940, seems a bit late to think of the protection and security of aircraft works.

Another Emergency Committee

THE Minister for Aircraft Production, Lord Beaverbrook, has appointed yet another emergency committee. This one is known as the Aircraft Equipment Emergency Committee, and its chairman is Major C. J. Stewart, for many years at the Royal Aircraft Establishment at Farnborough, and more recently Director of Civil Research and Production at the Air Ministry. Members of the committee are Sir Allan Gordon-Smith, managing director of S. Smith and Sons, and Mr. F. J. E. Brake, managing director of Creed and Co., Ltd.

Royal Canadian Air Force photograph.

VISIT TO TRENTON. Air Vice-Marshal L. D. D. McKean (with attache case), Air Chief Liaison Officer, inspected the Royal Canadian Air Force Station at Trenton recently, including the Air Armament School, the Central Flying School, the Air Navigation School, and the School of Administration. He is seen here with officers of the R.C.A.F.

Bermuda Again

WHEN the Pan-American *Dixie Clipper* left New York on June 20 the passengers were unaware that they were going to call at Bermuda, but when two hours out from New York they were so informed because, it was said, a swell at the Azores would make landing there difficult. There has been some speculation as to whether this was done so as to aid Britain by making censorship of the mail possible at Bermuda, and it was reported that the Azores weather was said to have been clear and calm. The *Yankee Clipper*, which arrived at New York on the same day, also called at Bermuda.

Lisbon Airport

A NEW airport for Lisbon at Portela de Sacavem, to replace the Sintra airport for civil aviation, is nearing completion, it is reported by *Aeronautical World News*. The new airport is about 3½ miles from the city and 2½ miles from the seaplane port at Cabo Ruivo which is used by the Pan-American Airways. Several direct avenues connect the city and airport. There will be four runways about 3,936ft. in length and one of which may be extended to 6,560ft. Each runway will be 820ft. in width, divided into three strips, the central one to be paved and 164ft. wide, while the flanking strips will be 328ft. wide and sodded. The central building will occupy about 100,000 sq. ft. and have two floors. It will house the administrative offices, the airline offices, Government offices, and auxiliary services. Tenders have been invited for the lighting, communications and other installations.

Over the Border

REGULATIONS regarding international airlines operating into Canada have been relaxed by an order-in-council and machines of such airlines may now land at 11 specified Canadian airports without first receiving permission.

Previously such permission had to be obtained from customs inspectors before flights into Canada were made. Now planes may alight at the airports and pilots report to customs inspectors on arrival. The 11 airports are: Moncton, N.E.; Shediac, N.B.; St. Hubert at Montreal; the Island and Malton airports at Toronto, Hamilton, Windsor, Ont., Winnipeg, Lethbridge, Vancouver and Whitehorse.

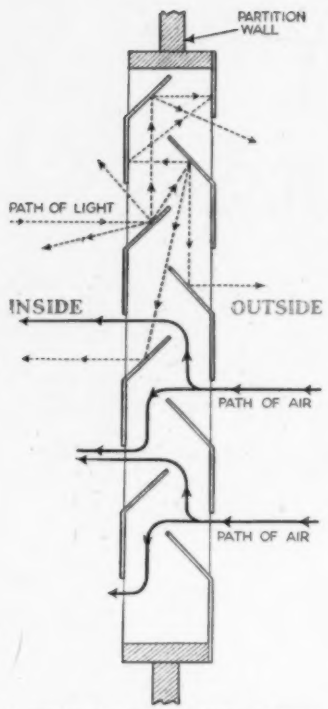
Canadian Statistics

DURING the first three months of 1940 Canada had 793 licensed private pilots, 156 commercial pilots, 195 limited commercial pilots, 144 transport pilots, 735 air engineers, and 8 airport traffic control officers, according to a report just issued by the Civil Aviation Branch of the Department of Transport, Ottawa. At the end of March there were 62 private and 412 commercial airplanes with certificates in force.

During the same period the 22 light airplane clubs had a membership of 2,683, used 103 airplanes, had 721 members under instruction, flew a total of 10,313 hours (one-third the record total of 31,210 hours in 1939), and were given Government grants for 39 private and 8 commercial pilots trained and licensed.

International air traffic during the first quarter of 1940, at the airports at Montreal, Winnipeg and Vancouver, accounted for a total of 870 Canadian and United States aeroplanes entering and the same number leaving the airports on international runs. Nearly 10,000 air passengers were handled internationally at the three airports, while mail between the two countries amounted to 56,000 lb.

THE INDUSTRY



A section of the Colt Black-out Ventilator showing the angle of the light trap louvres.

Dural Age-hardening

THE attention of technical staffs is drawn to an important paper given before the Institute of Metals by J. C. Arrowsmith, M.Met., and K. J. B. Wolfe, M.Sc., dealing with the use of refrigeration for delaying the age-hardening of duralumin type alloys, with special reference to the production of large pressings for aircraft. It is contained in the May issue of the Journal of the Institute of Metals, or reprints are to be had from the Pressed Steel Company, Ltd., Cowley, Oxford, of whose staff the joint authors are members.

War Workers' Health

IN an emergency report, by the Industrial Health Research Board of the Medical Research Council, it is claimed that the adoption of certain recommended measures improves the health, comfort and efficiency of workers in factories. Production is increased and discontent and fatigue avoided.

The report is based on many years' research and deals with the subject-matter under four main headings: (1) Output and fatigue in relation to excessive hours with insufficient intervals for rest. (2) Effects of inadequate or unsatisfactory lighting, heating and ventilation. (3) Causation and prevention of accidents. (4) Recording of sickness absence and accidents as a guide to loss of efficiency and well-being.

The evidence and arguments are simply presented and no refuge has been taken in medical jargon. Whether a factory employs 50 or 5,000 people the broad principles are the same. The report is obtainable from H.M. Stationery Office, price 7d., post free, and is called Industrial Health in War.

Black-out Fug Defeated

BLACK-OUT conditions impose upon us two major hardships; absence of daylight and absence of ventilation. While the former can be alleviated to some considerable extent by the installation of special lighting, the latter has presented a severe problem. Black-out fug has been blamed for loss of production owing to the effect of bad ventilation on workers' health and, even where actual absence from work caused by sickness does not occur, there seems to be a lowered vitality and predisposition to disease among those who have to spend long hours under such conditions. Colt Ventilation Limited, who for many years have specialised in introducing fresh air in difficult circumstances, have produced the Colt Black-out Ventilator to defeat this fug and the result is very successful.

As will be seen from the sectioned view illustrated on this page, the angles of the louvres have been so arranged as to make it impenetrable to the passage of light—less than 0.0009 per cent. of the original intensity is passed—there is, at the same time, practically no restriction to the movement of air in either direction.

An astounding feature is that these results can be obtained from a ventilator which is but 1¼in. thick and is light enough to be hung as part of a black-out curtain or blind in order that the window may be left open behind it. Prices vary from 4s. 6d. to 11s. 6d., according to size and purpose, and they are to be had from Colt Ventilation Limited, Bush House, Strand, London, W.C.2.

Hawker Siddeley Interim

THE directors of Hawker Siddeley Aircraft Company, Ltd., have declared an interim dividend of 15 per cent. actual, less tax, on the Ordinary shares on account of the year ending July 31st, 1940, payable on July 3rd, 1940.

Aluminium Technique

ALUMINIUM Union Limited have issued the seventh of their "Aluminium Technique" booklets. The subject-matter is "The Surface Treatment of Aluminium Castings."

It is a comprehensive summary of up-to-date practice in mechanical finishing, anodic treatment, electro deposits, painted or laquered finishes and applied special coatings. Copies are to be had from Aluminium Union Limited, The Adelphi, Strand, London, W.C.2.

Amphenol Connectors

THE American Phenolic Corporation announces a new series of electrical connectors for aircraft and other purposes. They have been designed in accordance with U.S. Army and Navy requirements and are available with from 1 to 42 contacts for current ratings of 5 to 200 amperes. It is significant that they have been selected for use on the new Curtiss-Wright substrosphere machine for inter-communication and other key purposes. The American Phenolic Corporation has numerous agents, but the head office is at 1,250 Van Buren Street, Chicago, U.S.A.

AERONAUTICAL PATENT SPECIFICATIONS

1939.

8455. DAIMLER-BENZ AKT.-GES. Guidance and springing of vehicle axles (519,608).
18690. STANDARD TELEPHONES AND CABLES, LTD. Radio direction-finding systems (519,461).
25473. BRISTOL AEROPLANE CO., LTD., and FEDDEN, A. H. R. Fluid-transmission circuits in variable-pitch airscrews (519,562).

1938.

(*Published May 2, 1940.*)

22389. LONGACRE, J. Retractable aircraft wing-flaps (519,718).
22571. WASEIGE, C. R. Variable-pitch aerial propellers (519,622).
23763. MESSERSCHMITT, W. Arrangements for sucking-off the boundary layer on aeroplane wings (519,623).
27625. OLAER PATENT CO. Retractable landing-gear for aircraft (519,681).
28152. ROWLEDGE, A. J. Sleeve-valve internal-combustion engines (519,659).
28506. BREVETS AERO-MECANIQUES SOC. ANON. Lubricant-cooling means for liquid-cooled internal-combustion engines (519,752).
28700. ALEXANDER, R. M. Aircraft (519,704).
29690. SARAZIN, R. R. R. Damping of vibrations in airscrews (519,866).

1939.

4259. DELANEY, C. T., and GALLAY, LTD. Steam-heated air heaters used in airplanes (519,712).
9617. GEORGE, W. L., and GALLAY, LTD. Boiler for aircraft, ships, locomotives, or motor road vehicles (519,713).
31478. WASEIGE, C. R. Variable-pitch aerial propellers (519,666).
32391. WASEIGE, C. R. Variable-pitch aerial propellers (519,667).

(*Published May 9, 1940.*)

28125. ALEBON, J., and AEROGRAPH CO., LTD. Spraying-apparatus (520,030).
28611. BERGLAS, A. De-icing means for aircraft (519,882).
30286. LAKE, A. E. Apparatus for manœuvring aircraft (520,051).
37519. SCHNEIDER & CIE, and FIEUX, J. Catapults for launching aeroplanes (520,006).

(*Published May 16, 1940.*)

1938.

15043. BIRMINGHAM SMALL ARMS CO., LTD., FAULKNER, H. A., and WACKROW, R. D. Cartridge belts for automatic firearms (520,278).
20224. PRATT, J. H., MANLEY, G. E., and GIRLING, A. H. G. Vehicle brakes (520,279).
20797. SMITH AND SONS (MOTOR ACCESSORIES), LTD., S., and MEREDITH, F. W. Gyroscopic apparatus for the automatic control of aircraft (520,175).
20798. SMITH AND SONS (MOTOR ACCESSORIES), LTD., S., and MEREDITH, F. W. Automatic steering of aircraft (520,176).
20801. SMITH AND SONS (MOTOR ACCESSORIES), LTD., S., and MEREDITH, F. W. Automatic control apparatus for aircraft (520,177).
25057. INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD., TARRIS, F. J., and WEBB, D. Gun-fire-control mechanisms (520,329).
27186. DOWTY, G. H. Landing-gear of aircraft (520,332).
29294. ELECTROFLO METERS CO., LTD., and COULING, C. W. Electrical indicating and/or recording instruments (520,136).

INCREASES OF CAPITAL

MOULDED COMPONENTS (JABLO), LTD.—Manufacturers of component parts for aircraft, ships, etc. Brettenham House, Lancaster Place, W.C.2. The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares, beyond the registered capital of £10,000.

AEROPLASTICS, LTD. (formerly Deekay Aircraft Corporation, Ltd.), 101, Leadenhall Street, E.C. The nominal capital has been increased by the addition of £25,000, in £1 ordinary shares, beyond the registered capital of £25,000.

CRAWLEY AIRCRAFT AND PRECISION TOOL CO., LTD., Precision Works, Tushmore Lane, London Road, Crawley, Sussex.—The nominal capital has been increased by the addition of £4,900, in £1 ordinary shares, beyond the registered capital of £100.